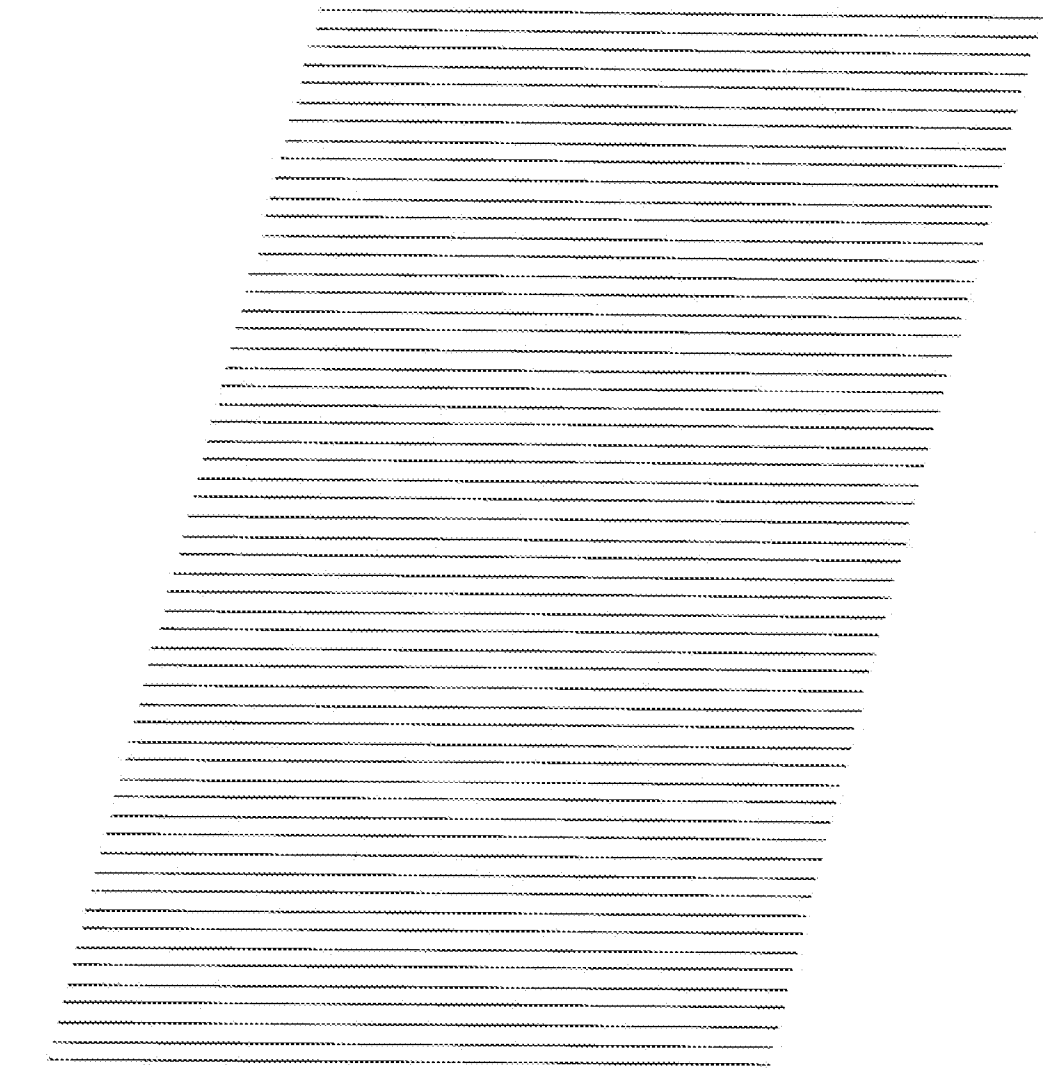
Exhibit B



TR45

Mobile Station-Base Station Compatibility Standard for Dual-Mode Spread Spectrum Systems

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PREFACE

These technical requirements form a compatibility standard for 800 MHz cellular mobile telecommunications systems and 1.8 to 2.0 GHz Code Division Multiple Access (CDMA) Personal Communications Services (PCS) systems. They ensure that a mobile station can obtain service in a cellular or PCS system manufactured according to this standard. These requirements do not address the quality or reliability of that service, nor do they cover equipment performance or measurement procedures.

To ensure compatibility (see Note 1), both radio-system parameters and call-processing procedures must be specified. The sequence of call-processing steps that the mobile stations and base stations execute to establish calls has been specified along with the digital control messages and analog signals that are exchanged between the two stations.

The base station is subject to fewer compatibility requirements than the dual-mode mobile station. Radiated power levels, both desired and undesired, are fully specified for dual-mode mobile stations to control the RF interference that one mobile station can cause another. Base stations are fixed in location and their interference is controlled by proper layout and operation of the system in which the station operates. Detailed call-processing procedures are specified for mobile stations to ensure a uniform response to all base stations. Base station call procedures are not specified in detail because they are a part of the overall design of the individual land system. However, the base station call-processing procedures must be compatible with those specified for the mobile station. This approach to writing the compatibility specification provides the land system designer with sufficient flexibility to respond to local service needs and to account for local topography and propagation conditions.

This specification includes provisions for future service additions and expansion of system capabilities.

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1 GENERAL

1.1 Terms and Numeric Information

1.1.1 Terms

Abbreviated Alert. An abbreviated alert is used to remind the mobile station user that previously selected alternative routing features are still active.

AC. See Authentication Center.

Access Attempt. The entire process of sending one message and receiving (or failing to receive) an acknowledgment for that message, consisting of one or more access sub-attempts. See also Access Probe, Access Probe Sequence, and Access Sub-attempt.

Access Channel. A Reverse CDMA Channel used by mobile stations for communicating to the base station. The Access Channel is used for short signaling message exchanges such as call originations, responses to pages, and registrations. The Access Channel is a slotted random access channel.

Access Channel Message. The information part of an access probe consisting of the message body, length field, and CRC.

Access Channel Message Capsule. An Access Channel message plus the padding.

Access Channel Preamble. The preamble of an access probe consisting of a sequence of all-zero frames that is sent at the 4800 bps rate.

Access Channel Request Message. An Access Channel message that is autonomously generated by the mobile station. See also Access Channel Response Message.

Access Channel Response Message. A message on the Access Channel generated to reply to a message received from the base station.

Access Channel Slot. The assigned time interval for an access probe. An Access Channel slot consists of an integer number of frames. The transmission of an access probe is performed within the boundaries of an Access Channel slot.

Access Entry Handoff. The act of transferring reception of the Paging Channel from one base station to another, when the mobile station is transitioning from the *Mobile Station Idle State* to the *System Access State*.

Access Handoff. The act of transferring reception of the Paging Channel from one base station to another, when the mobile station is in the *System Access State* after an Access Attempt.

Access Overload Class. See Overload Class.

Access Probe. One Access Channel transmission consisting of a preamble and a message. The transmission is an integer number of frames in length and transmits one Access Channel message. See also Access Probe Sequence, Access Sub-attempt, and Access Attempt.

Access Probe Handoff. A handoff that occurs while the mobile station is performing an Access Attempt in the *System Access State*.

Access Probe Sequence. A sequence of one or more access probes on the Access Channel. Other than the reported pilot information, the same Access Channel message content is transmitted in every access probe of an access sub-attempt. See also Access Probe, Access Sub-attempt, and Access Attempt.

Access Sub-attempt. A sequence of one or more access probe sequences on the Access Channel transmitted to one pilot, containing the same message content other than the reported pilot information. See also Access Probe, Access Probe Sequence, and Access Attempt.

Acknowledgment. A Layer 2 response by the mobile station or the base station confirming that a signaling message was received correctly.

Action Time. The time at which the action implied by a message should take effect.

Active Set. The set of pilots associated with the CDMA Channels containing Forward Traffic Channels assigned to a particular mobile station.

Aging. A mechanism through which the mobile station maintains in its Neighbor Set the pilots that have been recently sent to it from the base station and the pilots whose handoff drop timers have recently expired.

A-key. A secret, 64-bit pattern stored in the mobile station and HLR/AC. It is used to generate/update the mobile station's Shared Secret Data.

Analog Access Channel. An analog control channel used by a mobile station to access a system to obtain service.

Analog Color Code. An analog signal (see Supervisory Audio Tone) transmitted by a base station on an analog voice channel and used to detect capture of a mobile station by an interfering base station or the capture of a base station by an interfering mobile station.

Analog Control Channel. An analog channel used for the transmission of digital control information from a base station to a mobile station or from a mobile station to a base station.

Analog Paging Channel. A forward analog control channel that is used to page mobile stations and send orders.

Analog Voice Channel. An analog channel on which a voice conversation occurs and on which brief digital messages may be sent from a base station to a mobile station or from a mobile station to a base station.

Authentication. A procedure used by a base station to validate a mobile station's identity.

Authentication Center (AC). An entity that manages the authentication information related to the mobile station.

Authentication Response (AUTHR). An 18-bit output of the authentication algorithm. It is used, for example, to validate mobile station registrations, originations and terminations.

Autonomous Registration. A method of registration in which the mobile station registers without an explicit command from the base station.

AWGN. Additive White Gaussian Noise.

Bad Frames. Frames classified as insufficient frame quality or as 9600 bps primary traffic only, with bit errors. See also Good Frames.

Band Class. A set of frequency channels and a numbering scheme for these channels.

Base Station. A fixed station used for communicating with mobile stations. Depending upon the context, the term base station may refer to a cell, a sector within a cell, an MSC, or other part of the cellular system. See also MSC.

Base Station Authentication Response (AUTHBS). An 18-bit pattern generated by the authentication algorithm. AUTHBS is used to confirm the validity of base station orders to update the Shared Secret Data.

Base Station Random Variable (RANDBS). A 32-bit random number generated by the mobile station for authenticating base station orders to update the Shared Secret Data.

BCH Code. See Bose-Chaudhuri-Hocquenghem Code.

Blank-and-Burst. The preemption of an entire Traffic Channel frame's primary traffic by signaling traffic or secondary traffic. Blank-and-burst is performed on a frame-by-frame basis.

Bose-Chaudhuri-Hocquenghem Code (BCH Code). A large class of error-correcting cyclic codes. For any positive integers m, $m \geq 3$, and $t < 2^{m-1}$, there is a binary BCH code with a block length n equal to $2^m - 1$ and $n - k \leq mt$ parity check bits, where k is the number of information bits. The BCH code has a minimum distance of at least $2t + 1$.

bps. Bits per second.

Call Disconnect. The process that releases the resources handling a particular call. The disconnect process begins either when the mobile station user indicates the end of the call by generating an on-hook condition or other call release mechanism, or when the base station initiates a release.

Call History Parameter (COUNT). A modulo-64 event counter maintained by the mobile station and Authentication Center that is used for clone detection.

Candidate Frequency. The frequency for which the base station specifies a search set, using a *Candidate Frequency Search Request Message*.

Candidate Set. The set of pilots that have been received with sufficient strength by the mobile station to be successfully demodulated, but have not been placed in the Active Set by the base station. See also Active Set, Neighbor Set, and Remaining Set.

CDMA. See Code Division Multiple Access.

CDMA Candidate Frequency. The Candidate Frequency specified for a search of CDMA pilots.

CDMA Cellular System. The entire system supporting Domestic Public Cellular Service operation as embraced by this Standard.

CDMA Channel. The set of channels transmitted between the base station and the mobile stations within a given CDMA frequency assignment. See also Forward CDMA Channel and Reverse CDMA Channel.

CDMA Channel Number. An 11-bit number corresponding to the center of the CDMA frequency assignment.

CDMA Frequency Assignment. A 1.23 MHz segment of spectrum. For CDMA cellular systems, the channel is centered on one of the 30 kHz channels of the existing analog cellular system. For CDMA PCS systems, the channel is centered on one of the 50 kHz channels.

CDMA PCS System. The entire system supporting Personal Communications Services as embraced by this Standard.

CDMA Preferred Set. The set of CDMA channel numbers in a CDMA system corresponding to frequency assignments that a mobile station will normally search to acquire a CDMA Pilot Channel. For CDMA cellular systems, the primary and secondary channels comprise the CDMA Preferred Set.

Code Channel. A subchannel of a Forward CDMA Channel. A Forward CDMA Channel contains 64 code channels. Code channel zero is assigned to the Pilot Channel. Code channels 1 through 7 may be assigned to the either Paging Channels or the Traffic Channels. Code channel 32 may be assigned to either a Sync Channel or a Traffic Channel. The remaining code channels may be assigned to Traffic Channels.

Code Division Multiple Access (CDMA). A technique for spread-spectrum multiple-access digital communications that creates channels through the use of unique code sequences.

Code Symbol. The output of an error-correcting encoder. Information bits are input to the encoder and code symbols are output from the encoder. See Convolutional Code.

Continuous Transmission. A mode of operation in which Discontinuous Transmission is not permitted.

Control Mobile Attenuation Code (CMAC). A 3-bit field in the Control-Filler Message that specifies the maximum authorized power level for a mobile transmitting on an analog reverse control channel.

Convolutional Code. A type of error-correcting code. A code symbol can be considered as the convolution of the input data sequence with the impulse response of a generator function.

CRC. See Cyclic Redundancy Code.

Cyclic Redundancy Code (CRC). A class of linear error detecting codes which generate parity check bits by finding the remainder of a polynomial division. See also Frame Quality Indicator.

Data Block. A unit of data transmitted by the mobile/base station. For Multiplex Options 1 and 2, one data block is transmitted by the mobile/base station every 20 ms. For Multiplex Options 2n - 1, n = 2 through 8, at least one data block, and at most n data blocks, are transmitted by the mobile/base station every 20 ms. For Multiplex Options 2n,

n = 2 through 8, at least one data block, and at most n data blocks, may be transmitted by the mobile/base station every 20 ms.

Data Burst Randomizer. The function that determines which power control groups within a frame are transmitted on the Reverse Traffic Channel when the data rate is lower than the maximum rate for the rate set. The data burst randomizer determines, for each mobile station, the pseudorandom position of the transmitted power control groups in the frame while guaranteeing that every modulation symbol is transmitted exactly once.

dBc. The ratio (in dB) of the sideband power of a signal, measured in a given bandwidth at a given frequency offset from the center frequency of the same signal, to the total inband power of the signal. For CDMA, the total inband power of the signal is measured in a 1.23 MHz bandwidth around the center frequency of the CDMA signal.

dBm. A measure of power expressed in terms of its ratio (in dB) to one milliwatt.

dBm/Hz. A measure of power spectral density. The ratio, dBm/Hz, is the power in one Hertz of bandwidth, where power is expressed in units of dBm.

dBW. A measure of power expressed in terms of its ratio (in dB) to one Watt.

Dedicated Control Channel. An analog control channel used for the transmission of digital control information from either a base station or a mobile station.

Deinterleaving. The process of unpermuting the symbols that were permuted by the interleaver. Deinterleaving is performed on received symbols prior to decoding.

Digital Color Code (DCC). A digital signal transmitted by a base station on a forward analog control channel that is used to detect capture of a base station by an interfering mobile station.

Dim-and-Burst. A frame in which primary traffic is multiplexed with secondary, signaling, or secondary and signaling traffic.

Discontinuous Transmission (DTX). A mode of operation in which a mobile station transmitter autonomously switches between two transmitter power levels while the mobile station is in the conversation state on an analog voice channel.

Distance-Based Registration. An autonomous registration method in which the mobile station registers whenever it enters a cell whose distance from the cell in which the mobile station last registered exceeds a given threshold.

DTMF. See Dual-Tone Multifrequency.

Dual-Tone Multifrequency (DTMF). Signaling by the simultaneous transmission of two tones, one from a group of low frequencies and another from a group of high frequencies. Each group of frequencies consists of four frequencies.

E_b. The energy of an information bit.

E_c/I_o. The ratio in (dB) between the pilot energy accumulated over one PN chip period (E_c) to the total power spectral density (I_o) in the received bandwidth.

Effective Isotropically Radiated Power (EIRP). The product of the power supplied to the antenna and the antenna gain in a direction relative to an isotropic antenna.

Effective Radiated Power (ERP). The product of the power supplied to the antenna and its gain relative to a half-wave dipole in a given direction.

EIRP. See Effective Isotropic Radiated Power.

Electronic Serial Number (ESN). A 32-bit number assigned by the mobile station manufacturer, uniquely identifying the mobile station equipment.

Encoder Tail Bits. A fixed sequence of bits added to the end of a block of data to reset the convolutional encoder to a known state.

Erasure Indicator Bit. A bit used in the Rate Set 2 Reverse Traffic Channel frame structure to indicate an erased Forward Fundamental Code Channel frame.

ERP. See Effective Radiated Power.

ESN. See Electronic Serial Number.

Extended Protocol. An optional expansion of the signaling messages between the base station and mobile station to allow for the addition of new system features and operational capabilities.

Fade Timer. A timer kept by the mobile station as a measure of Forward Traffic Channel continuity. If the fade timer expires, the mobile station drops the call.

Flash. An indication sent on an analog voice channel or CDMA Traffic Channel indicating that the user directed the mobile station to invoke special processing.

Foreign NID Roamer. A mobile station operating in the same system (SID) but a different network (NID) from the one in which service was subscribed. See also Foreign SID Roamer and Roamer.

Foreign SID Roamer. A mobile station operating in a system (SID) other than the one from which service was subscribed. See also Foreign NID Roamer and Roamer.

Forward Analog Control Channel (FOCC). An analog control channel used from a base station to a mobile station.

Forward Analog Voice Channel (FVC). An analog voice channel used from a base station to a mobile station.

Forward CDMA Channel. A CDMA Channel from a base station to mobile stations. The Forward CDMA Channel contains one or more code channels that are transmitted on a CDMA frequency assignment using a particular pilot PN offset. The code channels are associated with the Pilot Channel, Sync Channel, Paging Channels, and Traffic Channels. The Forward CDMA Channel always carries a Pilot Channel and may carry up to one Sync Channel, up to seven Paging Channels, and up to 63 Traffic Channels, as long as the total number of channels, including the Pilot Channel, is no greater than 64.

Forward Fundamental Code Channel. A Fundamental Code Channel which is transmitted on the Forward CDMA Channel.

Forward Supplemental Code Channel. A Supplemental Code Channel which is transmitted on the Forward CDMA Channel.

Forward Traffic Channel. One or more code channels used to transport user and signaling traffic from the base station to the mobile station. See Forward Fundamental Code Channel and Forward Supplemental Code Channel.

Frame. A basic timing interval in the system. For the Access Channel, Paging Channel, and Traffic Channel, a frame is 20 ms long. For the Sync Channel, a frame is 26.666... ms long.

Frame Category. A classification of a received Traffic Channel frame based upon transmission data rate, the frame contents (primary traffic, secondary traffic, or signaling traffic), and whether there are detected errors in the frame.

Frame Offset. A time skewing of Traffic Channel frames from System Time in integer multiples of 1.25 ms. The maximum frame offset is 18.75 ms.

Frame Quality Indicator. The CRC check applied to 9.6 and 4.8 kbps Traffic Channel frames (for Rate Set 1) and 14.4, 7.2, 3.6 and 1.8 kbps Traffic Channel frames (for Rate Set 2).

Full TMSI. The combination of TMSI_ZONE and TMSI_CODE. The full TMSI is a globally unique address for the mobile station.

Fundamental Code Channel. A portion of a Traffic Channel (Forward or Reverse) which is always present, and which carries a combination of primary data, secondary data, signaling, and power control information.

Fundamental Data Block. A data block that is transmitted by the mobile/base station in every 20 ms time interval on the Fundamental Code Channel.

GHz. Gigahertz (10^9 Hertz).

Global Positioning System (GPS). A US government satellite system that provides location and time information to users. See Navstar GPS Space Segment / Navigation User Interfaces ICD-GPS-200 for specifications.

Good Frames. Frames not classified as bad frames. See also Bad Frames.

GPS. See Global Positioning System.

Half Frame. A 10 ms interval on the Paging Channel. Two half frames comprise a frame. The first half frame begins at the same time as the frame.

Handoff. The act of transferring communication with a mobile station from one base station to another.

Hard Handoff. A handoff characterized by a temporary disconnection of the Traffic Channel. Hard handoffs occur when the mobile station is transferred between disjoint Active Sets, the CDMA frequency assignment changes, the frame offset changes, or the mobile station is directed from a CDMA Traffic Channel to an analog voice channel. See also Soft Handoff.

Hash Function. A function used by the mobile station to select one out of N available resources. The hash function distributes the available resources uniformly among a random sample of mobile stations.

- *Conversation Substate* - In this substate, the base station exchanges Traffic Channel frames with the mobile station in accordance with the current service configuration.
- *Release Substate* - In this substate, the base station disconnects the call.

7.6.4.1 Special Functions and Actions

The base station performs the following special functions and actions in one or more of the Traffic Channel processing substates:

7.6.4.1.1 Forward Traffic Channel Power Control

When the base station enables Forward Traffic Channel power control, the mobile station reports frame error rate statistics to the base station using the *Power Measurement Report Message*.

The base station may enable Forward Traffic Channel power control using the *System Parameters Message* sent on the Paging Channel and the *Power Control Parameters Message* sent on the Forward Traffic Channel. The base station may enable periodic reporting which causes the mobile station to report frame error rate statistics at specified intervals. The base station may also enable threshold reporting which causes the mobile station to report frame error rate statistics when the frame error rate reaches a specified threshold.[9]

The base station may use the reported frame error rate statistics to adjust the transmit power of the Forward Traffic Channel.

7.6.4.1.2 Service Configuration and Negotiation

During Traffic Channel operation, the mobile station and base station communicate through the exchange of Forward and Reverse Traffic Channel frames. The mobile station and base station use a common set of attributes for building and interpreting Traffic Channel frames. This set of attributes, referred to as a service configuration, consists of the following:

1. Forward and Reverse Multiplex Options: These control the way in which the information bits of the Forward and Reverse Traffic Channel frames, respectively, are divided into various types of traffic, such as signaling traffic, primary traffic and secondary traffic. Associated with each multiplex option is a rate set which specifies the frame structures and transmission rates supported by the multiplex option (see, for example, 6.1.3.3.11). Multiplex Options 3 through 16 also indicate the capability for supporting Supplemental Code channel transmission on the Forward and Reverse Traffic Channels. Invocation of Supplemental Code Channel operation on the Forward or Reverse Traffic Channels occurs by the *Supplemental Channel Request Message*, the *Supplemental Channel Assignment Message*, and the *General Handoff Direction Message*. The multiplex option used for the Forward Traffic

[9] Both periodic and threshold reporting may be enabled, either one of the forms of reporting may be enabled, or both forms of reporting may be disabled via the *System Parameters Message* on the Paging Channel or the *Power Control Parameters Message* on the Forward Traffic Channel.